2014

Investment performance of "environmentally-friendly" firms and their initial public offers and seasoned equity offers

Pak To Chan
The Hong Kong University of Science And Technology

Terry S. Walter
University of Sydney, twalter@uow.edu.au

Publication Details

Chan, P. & Walter, T. (2014). Investment performance of "environmentally-friendly" firms and their initial public offers and seasoned equity offers. Journal of Banking and Finance, 44 (1), 177-188.

Investment performance of "environmentally-friendly" firms and their initial public offers and seasoned equity offers

Abstract
We employ a sample of 748 environmentally-friendly (or "green") firms listed on U.S. stock exchanges to extend studies of the effects of socially responsible investment (SRI) on stock investment returns and the performance of initial public offerings (IPOs) and seasoned equity offerings (SEOs). Our empirical tests document positive and statistically significant excess returns for our environmentally-friendly firms and their IPOs and SEOs, in contrast to our control IPO and SEO samples which underperform. In summary, a "green" equity premium is evident in returns calculated from a variety of benchmarks.

Disciplines
Business

Publication Details
Chan, P. & Walter, T. (2014). Investment performance of "environmentally-friendly" firms and their initial public offers and seasoned equity offers. Journal of Banking and Finance, 44 (1), 177-188.

Investment Performance of "Environmentally-Friendly" Firms and their Initial Public Offers and Seasoned Equity Offers

This version: 21 January, 2014

Abstract

We employ a sample of 748 environmentally-friendly (or "green") firms listed on U.S. stock exchanges to extend studies of the effects of socially responsible investment (SRI) on stock investment returns and the performance of initial public offerings (IPOs) and seasoned equity offerings (SEOs). Our empirical tests document positive and statistically significant excess returns for our environmentally-friendly firms and their IPOs and SEOs, in contrast to our control sample IPOs and SEOs which underperform. In summary, a "green" equity premium is evident in returns calculated from a variety of benchmarks.

JEL classifications: G14; G15; G39

Keywords: Environmentally-friendly firm performance; IPOs; SEOs; event study

1. Introduction

We investigate whether investment in environmentally friendly companies and their IPOs and SEOs is good for your wealth. We examine this issue empirically, because existing theory makes equivocal predictions. Our empirical results show that environmentally-friendly firms have positive risk-adjusted returns in the majority of our empirical investigations. In short, these investments are good for your (risk-adjusted) wealth. Our portfolios of environmentally-friendly firms outperform by seven per cent per annum. The frequently documented post-IPO performance decline is not present for environmentally-friendly IPOs, and the post-SEO drift is also not present. These drifts are however present in matched (control) samples of firms that do not qualify as environmentally-friendly.

Two hypotheses are frequently investigated when SRI and conventional fund returns are compared; an underperformance hypothesis and an over-performance hypothesis. In support of arguments of having higher cost structures for environmentally-friendly practices, the underperformance hypothesis predicts that the risk-adjusted returns for the SRI funds should be lower than those of conventional funds because the investment opportunity set for SRI funds is restricted by non-financial criteria. SRI investors must accordingly be willing to accept suboptimal mean-variance efficient

portfolios if they select companies with higher environmental, social responsibility, and corporate governance standards. This stock screening process violates classical finance theory which proposes that investors should maximize return subject to risk optimization. In contrast, the over-performance hypothesis indicates that this screening process may generate excess returns for SRI funds relative to conventional funds in the long run. The hypothesis argues that companies with higher corporate social responsibility standards can avoid potential costs of corporate social crises and environmental disasters. Hence, companies that ignore environmental responsibility may destroy long-term shareholder's wealth due to reputation losses or potential litigation costs, or both.

Prior studies have investigated the stock price movements associated with the environmental rankings. For example, Yamashita et al. (1999) report the relationship between environmental conscientiousness (EC) scores ranked by the 1993's Fortune magazine, and show that those companies with the worst EC scores have lower than average performance. Klassen and McLaughlin (1996) observe significant positive returns for strong environmental management as indicated by environmental performance awards, and significant negative returns for weak environmental management, indicated by environmental crises. Derwall et al. (2004) employ a

Carhart (1997) four-factor model based on "eco-efficiency" scores provided by Innovest Strategic Value Advisors and show that a portfolio of firms with high environmental scores outperformed a portfolio of firms with low scores by 6% per annum over the period 1997-2003. They argue that the market undervalues environmental news.

Previous research in the area of social responsibility has focused on SRI fund returns and the majority of them have supported the underperforming hypothesis. For example, Hamilton et al. (1993) find that social responsible mutual funds do not earn statistically significant excess returns and that their performance is statistically indistinguishable from conventional mutual funds. Cohen et al. (1997) construct two industry-balanced portfolios and compare accounting and market returns for a “high polluter” and “low polluter” portfolio. Overall, they find either no “penalty” for investing in the environmentally-friendly portfolio, or a positive return from green investing. Bauer et al. (2005) document evidence of insignificant differences in risk-adjusted returns between ethical and conventional funds. They adopt the Carhart (1997) multi-factor model. They suggest that ethical mutual funds undergo a “catching up phase” before achieving financial returns similar to those of conventional funds. Geczy et al. (2005) compare SRI portfolios to those constructed

from the broader fund universe and reveal that the costs of imposing a SRI constraint are substantial. Renneboog et al. (2008) document that SRI funds in the U.S., the U.K., and in many continental European and Asia-Pacific nations underperform their domestic benchmarks by between -2.2% and -6.5%.

Instead of comparing returns of SRI funds and conventional funds, some papers investigate whether there is return difference in broad indexes. For instance, Sauer (1997) compares the raw and risk-adjusted performance of the Domini 400 Social Index (DSI) with two unrestricted, well-diversified benchmark portfolios and suggests that effect of social responsibility criteria on performance is negligible. Statman (2000) also finds that the DSI performs as well as S&P500. The risk-adjusted returns of the DSI are slightly lower than those of the S&P500, but the difference is not statistically significant.

Contrary to the previous literature, our results support the over-performance hypothesis. This paper makes the following contributions to the existing literature: First, instead of comparing SRI and conventional fund returns, this paper constructs a pool of environmentally-friendly companies based on the constituents of environmental service indices or exchange-traded (ETF) funds listed on U.S. stock

exchanges. This approach avoids the confounding effects of transaction costs and management fees that are prevalent when mutual fund returns are compared. While prior research (Derwall et al., 2004) obtains eco-efficiency scores for companies from Innovest Strategic Value Advisors, we create a database based on publicly available information, thus reducing search costs for environmentally-oriented companies. We find that these portfolios, when investigated using a Carhart (1997) model, have seven percent excess returns per annum.

Second, this paper extends the investigation of environmentally-friendly investment to IPOs and SEOs. We select "control" companies which are matched with our environmentally-friendly companies based on firm-specific characteristics. Astonishingly, long-term underperformance exists for the "control" sample, while no such evidence is found for our environmentally-friendly (or "green") IPOs and SEOs. For example, the one-year BHARs for the environmentally-friendly and "control" IPOs are 12.4% and -7.1% respectively, while the one-year BHARs for the environmentally-friendly and "control" SEOs are 2.5% and -3.5% respectively, after controlling for size, book-to-market and momentum. A "green premium" exists primarily because environmentally-friendly investments have lower risks than "control" firms.

Third, we perform cross-sectional regressions for the environmentally-friendly and "control" samples and test several IPO and SEO hypotheses that have been advanced to explain short-term underpricing and long-term underperformance. We include a "green" dummy variable and examine whether the environmentally-friendly sample behaves differently to the "control" sample. For the long-term performance, the coefficients for our environmentally-friendly proxy variable are always positive and statistically significant, while there is no evidence of short-term underpricing for our both IPO and SEO samples.

This remainder of this paper is organized as follows: Data selection methods for the environmentally-friendly and "control" samples and empirical methods are described in Section 2. Section 3 presents the results for the portfolio returns for the environmentally-friendly companies. Section 4 presents the IPO and SEO results based on size, book-to-market, and momentum adjusted portfolios returns and cross-sectional regressions to explain both short-term and long-term equity returns. Conclusions and suggestions are offered in Section 5.

2. Data and methodology

2.1. Data selection

We develop a comprehensive database of all environmental companies and their IPOs and SEOs in the period 1990 to 2012. Our environmentally-friendly observations are selected based on constituents in environmentally-friendly (or "green") exchange-traded funds (ETFs) or indices which are listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and NASDAQ. Our sample also considers stocks which are listed in global indices. However, we only study those global environmentally-oriented companies which are listed in the U.S in the form of common shares or American Depository Receipts (ADRs). Descriptions of each environmentally-friendly indices or exchange-traded funds are shown in the Appendix. A company is included as a sample observation if it is a constituent in one of the environmentally-friendly indices at the date this index is first published. Going forward in time, the company counts as a valid observation until it is dropped from the index. On the other hand, we retain an observation going backward in time for our return analysis if the observation does not change its Standard & Poor's Industry Classification Codes (SICCD). Since the earlier inception date of an environmentally friendly index is 12/31/1999, therefore, the return calculations in the pre-1999 period are returns for a sample of environmentally-friendly firms that are based on an assumption that if they were environmentally-friendly in 1999 (for example) and they

do not change the fundamental nature of their SICs, then they are also environmentally friendly prior to 1999. The main reasons for adopting this back-dating approach are: (1) to extend the investigating period; (2) to allow us to calculate returns for longer investment horizons, let's say 3, 4, and 5 years; and (3) to ensure that we capture firms that form part of the portfolios of environmentally-friendly index service providers during periods in which such firms develop their environmental tracking record. We obtain stock return data and firm's annual accounting information from the Center for Research in Security Prices (CRSP) daily and monthly stock files and the Standard and Poor's Compustat database respectively. The IPO and SEO data are obtained from SDC Platinum.

2.2. Methodology

In this sub-section, we present our approaches to measuring performance of environmentally-friendly companies and the long-run returns after their IPOs and SEOs. First, buy-and-hold abnormal returns (BHARs) are based on equally-weighted market portfolios and portfolio benchmarks developed by Daniel, Grinblatt, Titman and Wermers ((1997), henceforth DGTW)[1]. The DGTW method controls for the

[1] We briefly discuss the benchmark construction procedure here and refer the reader to DGTW for further details. We start with all stocks having book equity values listed in Compustat, and stock returns

effects of size, book-to-market and momentum in computing abnormal long-run returns. The DGTW method is advocated as being superior to the two-factor (i.e., size and book-to-market) model of Fama and French (1992). The portfolios are reconstituted at the end of each June.

The BHAR for period τ is defined as

$$BHAR_{k\tau} = \prod_{t=1}^{\tau}(1+ER_{it}) - \prod_{t=1}^{\tau}(I+CR_{jt}) \qquad (1)$$

where $BHAR_{k\tau}$ is the buy-and-hold abnormal return for k sets of comparison; ER_{it} (CR_{it}) is the buy-and-hold investment return for the event firm i and benchmark portfolio j at daily (or monthly) t. For each event window, a conventional t-statistic based on the cross-sectional standard deviation of the firm's abnormal returns is calculated. The conventional t-statistic is defined as

---

and market capitalization of equity listed in CRSP. We then rank these stocks based on their market capitalization and assign them to size quintiles (using NYSE size quintile breakpoints). Within each size quintile, we further rank stocks based on their book-to-market ratios (industry adjusted), and assign them to book-to-market quintiles, yielding a total of 25 size- and book-to-market sorted fractiles. We further sort stocks in each of these 25 fractiles into quintiles, based on the prior 12-month return of each stock. This results in a total of 125 fractiles; monthly benchmark portfolio returns are then computed as the value-weighted holding period buy-and-hold abnormal returns (BHARs) of each of the 125 fractile portfolios.

$$t_{BHAR} = BHAR_p / (\sigma(BHAR_p) / sqrt(n)) \quad (2)$$

where $BHAR_p$ is the sample average and $\sigma(BHAR_p)$ is the cross-sectional sample standard deviation of the *BHAR*s for *n* firms. For panel data, Petersen (2009) notes that residuals may be correlated across firms or across time, and thus OLS measures can be biased. Therefore, we modify our approach and calculate clustered standard errors in two-dimensions (industry and time) as an alternative to conventional *t*-statistics measurements[2].

Second, this paper estimates long-run abnormal returns via a calendar-time portfolio approach based on Carhart's (1997) four-factor model[3]. For each calendar month, we calculate the equally-weighted portfolio returns. The number of firms in the calendar-time portfolio varies from month to month. The calendar-time returns on these portfolios are then used to estimate the following regression:

$$R_{pt} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + h_i HML_t + m_i MOM_t + \varepsilon_{it} \quad (3)$$

[2] To control for time and firm effects, Petersen (2009) clusters by firm and time in his two dimension setting. As "green" funds or index providers have adopted the "best-in-class" approach to select companies with good environment practices in each sector, we cluster the standard errors by industry (i.e., SICCD) and time in order to fit our selection criteria.

[3] The advantages of adopting the calendar-time portfolio approach are discussed in Barber and Lyon (1997) and Barber et al. (1999).

where R_{pt} is the monthly return on the equally-weighted calendar-time portfolio, R_{ft} is the monthly return on the risk-free asset; R_{mt} is the return on the value-weighted market portfolio; SMB_t is the difference in returns of value-weighted portfolios of small stocks and big stocks; HML_t is the difference in returns of value-weighted portfolios of high book-to-market stocks and low book-to-market stocks; MOM_t is the difference in returns of value-weighted portfolios of high-momentum and low-momentum stocks. The estimate of the intercept term (α_i) provides a test of the null hypothesis that the mean monthly excess return on the calendar-time portfolio is zero.

For the cross-sectional regressions on equity returns, we analyze whether underpricing and long-term stock return underperformance, which are documented by most prior IPO and SEO studies, are present in the environmentally-friendly and "control" samples. For short-term performance of IPOs and SEOs, we estimate the following regression:

$$\begin{aligned} Underpricing_i\ (SEO\ Discount_i) = {} & \alpha_1 + \beta_2 ln(amt)_i + \beta_3 Rank_i + \beta_4 Revision_i + \beta_5 (NUM)_i \\ & + \beta_6 RET_i + \beta_7 Bubble_i + \beta_8 Tech_i + \beta_9 EPS_i + \beta_{10} NYSE_i \\ & + \beta_{11} ADR_i + \beta_{12} GREEN_i + \varepsilon; \end{aligned} \quad (4)$$

For long-term performance of the IPOs and SEOs, we estimate the following regression:

$$BHAR_t = \alpha_1 + \beta_2 ln(at)_i + \beta_3 Underpricing_i\ (SEO\ Discount_i) + \beta_4 Rank_i + \beta_5 Revision_i + \beta_6 (NUM)_i + \beta_7 RET_i + \beta_8 Bubble_i + \beta_9 Tech_i + \beta_{10} EPS_i + \beta_{11} NYSE_i + \beta_{12} ADR_i + \beta_{13} GREEN_i + \varepsilon; \quad (5)$$

where $Underpricing_i$ ($SEO\ Discount_i$) is measured from the offer price to the first-day closing price; $BHAR_t$ is the buy-and-hold abnormal return based DGTW benchmarks; Amt_i (millions of dollars) is the dollar value of the amount of stock sold in the offering; $Rank_i$ is the rank of the lead underwriter using Loughran and Ritter (2004)[4]; following Hanley (1993), $Revision_i$ is the difference between the offer price and midpoint of the initial filing price relative to the mid-point of the initial filing range. Many authors suggest that the frequency of IPOs/SEOs and the magnitude of underpricing tends to increase during a bull market. To consider the economic and market conditions at the time of the filing, we include two control variables: NUM_i and RET_i which calculate

[4] $Rank_i$ is defined as the maximum rank if there is more than one underwriter. Benveniste and Spindt (1989) present a model in which underwriters induce investors (or subscribers) to honestly reveal their information regarding the true value of the securities being issued prior to the final pricing.

the number of firms going public or issuing additional equity during the 30 days, whereas RET_i is the BHAR based on value-weighted market portfolios benchmarks three months prior to the offer date for an IPO or SEO. Ritter and Welch (2002) report that the average underpricing increases dramatically during the internet bubble. To account for the especially high initial returns during this period we include a dummy variable $Bubble_i$ which is equal to one if the offer date occurs during 1999 and 2000, and zero otherwise. According to information asymmetry theories, initial returns will be higher for riskier firms, which suggest that firms in technology industries will be more underpriced. Therefore, we include a dummy variable $Tech_i$ which is equal to one if the firm is in a high technology industry as identified by Loughran and Ritter (2004); EPS_i is equal to one if the earnings per share is greater than zero, and zero otherwise; $NYSE_i$ is equal to one if the IPO/SEO firm is listed on the New York Stock Exchange; A portion of stocks included in the environmentally-oriented IPO and SEO samples are overseas companies. In order to capture the potential impact of non-U.S. domiciled firms on our results as suggested by Bell et al. (2012). We include a dummy variable ADR_i which is equal to one if the non-U.S. domiciled firm is listed on the U.S. stock exchanges in the form of American Depository Receipts (ADRs); $Green_i$ is equal to one if the IPO/ SEO firm is defined as an environmentally-friendly IPO /SEO, and zero otherwise.

3. Return analysis of the environmentally-friendly sample

Panel A of Table 1 reports BHARs based on DGTW benchmarks for the environmentally-friendly sample. The environmentally-friendly sample grows from 363 observations in 1990 to 736 observations in 2012. The excess returns are not positive and statistically significant every year; thus the so-called "green" premium is not persistent across time. For example, the median and mean BHAR in 1998 was -15.6% and -4.9%, respectively and statistically significant positive excess returns do not exist in 1995-99. However, positive excess returns are found in the latest period where the average BHAR between 2000 and 2010 is 14.2%.

<< Please insert Table 1>>

Panel B of Table 1 applies the Carhart (1997) four-factor model for monthly returns for our portfolios of environmentally-friendly companies. We further partition our samples into different periods to investigate whether the persistence of green premium exists over time. Panel B depicts results that suggest the environmentally-friendly sample performed better than the portfolio benchmark; alpha is 0.62 percent per month (the *t*-statistic is statistically significant at the 1 percent level). The environmentally-friendly (or "green") beta is 1.02. The

coefficients for SMB and HML are 0.37 and 0.30 respectively, both of which are significant, implying that the environmentally-friendly portfolio has an exposure to smaller growth-oriented stocks. Renneboog et al. (2011) find that ethical money chases past returns, however, our results do not support this argument because the momentum factor is negative and statistically significant.

Bebchuk et al. (2013) and Borgers et al. (2013) both suggest that the positive abnormal returns due to errors in investors' expectations will be ceased as attention for such information increased. Our findings support this argument. For instance, in the Panel A of Table 1, the BHARs for 2011 and 2012 are -0.051 (t-statistic -4.54) and 0.005 (t-statistic 0.37), respectively. On the other hand, the alpha in Cahart four-factor model drops to 0.39 per month in the period of 2005-2012, which is somewhat lower than 0.67 per month in the period of 2000-2012. Hence, our findings support the view that over time learning takes place and the errors in investors' expectations diminish.

To conclude, our results in Table 2 suggest positive excess returns for our environmentally-oriented companies. The results so far are based on classifications that can be made from publicly available information; accordingly developing portfolios of environmentally-friendly investments does not involve high search costs,

which gives us a strong motivation to use the environmentally-friendly sample to investigate questions relating to IPO and SEO financing. We now turn to these matters.

4. Event studies: IPOs and SEOs

4.1. Descriptive statistics for environmentally-friendly and "Control" firms

Table 2 presents summary descriptive statistics for environmentally-friendly and "control" IPO and SEO firms for the period 1990-2012. The environmentally-friendly IPO and SEO companies are defined in the Appendix. "Control" IPO and SEO companies are constructed by matching on (i) time of the capital raising, (ii) industry sectors, and (iii) market capitalization. In order to fulfill this requirement, the environmentally-friendly and "control" IPO and SEO firms must be listed in the same month and year. In addition, "control" firms are selected from the same 3-digit industry codes as environmentally-friendly firms. If a corresponding "control" firm cannot be found, the same 2-digit industry codes are used. Firms are matched on size using the firm closest in size in the range of 25% and 200% of the environmentally-friendly firm's size, measured at the end of each year. The *Underpricing or SEO discount* is measured from the offer price to the first-day

closing price. *Amount* (millions of dollars) is the dollar value of the amount of stock sold in the offering. *Money left on the table* (millions of dollars) is calculated as the number of shares issued times the change from the offer price to the first-day closing price. Following Hanley (1993), we define *Revision* as the difference between the offer price and midpoint of the initial filing price scaled by the mid-point of the initial filing range. *Underwriter Rank* is the rank of the lead underwriter as adopted by Loughran and Ritter (2004). These rankings are on a zero to nine scales, with nine representing the most reputable underwriters. *Dilution* is the reduction in the ownership percentage of current investors, founders, and employees caused by the issuance of new shares. *Gross spread* is defined as total expenses (underwriting fees, management fees, re-allowances and selling concessions) as a percentage of total proceeds. *EPS* (cents) is the earnings per share for the fiscal year prior to the offer date. The *PE ratio* is the market price divided by *EPS* for the fiscal year prior to the offer date.[5] *IPONUM (SEONUM)* is the number of firms going public (issuing equity) during the previous 30 days. In order to control for the market movement prior to an IPO, Cook et al. (2006) compute the NASDAQ return prior to the offering date. Instead, we define *RET* as the BHARs based on the value-weighted market portfolios benchmarks three months prior to the offer date for an IPO or SEO.

[5] If EPS is negative we do not calculate a PE ratio and thus treat the observation as missing.

<< Please insert Table 2>>

For the samples of IPOs, there is clear evidence of underpricing, with the initial returns for the environmentally-friendly and "control" IPOs being 15.57% and 16.10%, respectively. The dollar value of the amount of stock sold in an environmentally-friendly offering is more than that of "control" firms. Similar results pertain to money left on the table. Environmentally-friendly IPOs attract higher-reputation investment banks for their IPOs, and these banks charge lower underwriting fees, resulting in a lower gross spread[6]. Interestingly, the median and mean EPS for environmentally-friendly firms are 0.49 and 0.31, respectively, which suggest that environmentally-oriented companies are profitable stocks.

When environmentally-friendly firms go back to the market with a SEO the offer price has doubled compared to the IPO offer price. Shares are fairly priced with no money left on the table. Subscribers are less willing to buy both environmentally-friendly and "control" SEOs, but they still prefer environmentally-friendly SEOs than "control" SEOs, as indicated by a lower price

[6] As shown in Table 2, the medians gross spread for our "green" and "control" IPO samples are 7.0%. This result is consistent with the findings in Cliff and Dennis (2004) which show that underwriter spreads in IPOs are clustered at 7% for all but the very smallest and very largest offerings.

revision for environmentally-friendly SEOs. Similar to the IPO results, environmentally-friendly SEOs use more prestigious underwriters, who again have a lower gross spread. The mean EPS for the environmentally-friendly SEOs has tripled compared that of IPO firms.

4.2. BHARs for IPOs and SEOs

The post-IPO and post-SEO BHARs based on DGTW (1997) portfolios are presented in the Panels A and B of Table 3, respectively. We calculate one month and up to five years post-event returns after IPOs and SEOs. The main finding of Table 3 is that the "control" sample of IPO stocks underperform in the long-run. However, surprisingly, positive and statistically significant excess stock returns are observed for the environmentally-friendly IPO stocks after listing. The median and mean of the 1-month BHARs are 1.3% and 3.8%, respectively. For investors who purchase environmentally-oriented stocks through the IPOs and sell the stocks one year after listing, they make 12.4% excess returns on average. The median of the one year return is 8.1%. The divergence of median and mean return series is more severe in the long-run horizons, as the 5-year median and mean are 9.1% and 49.7%, respectively. The large return differential between median and mean returns indicates that the return distribution is positively skewed. For the "control" IPO sample, no statistically

significant abnormal returns are encountered in short-term horizons. However, underperformance of IPO "control" stocks is found in the long-run. The 1-year, 3-year, and 5-year post-IPO returns are -7.1%, -15.6% and -7.8% with *t*-statistics-2.53, -3.52 and -1.15, respectively. In contrast to environmentally-friendly IPO stocks, the return distribution for the "non-green" IPO stocks is negative skewed. The return differential between environmentally-friendly and "control" samples diverge from 3.4% one month after listing to 57.5% for a five-year investment horizon. Additional tests reveal that the differences in mean returns between the environmentally-friendly and "control" stocks are significantly different from zero in all time partitions, with the sole exception being the 1-month period.

<<Please insert Table 3>>

In Panel B of Table 3, positive and statistically significant abnormal returns are also found for environmentally-friendly SEO stocks. The 1-month BHAR is 0.2% after a new issuance of stock. For subscribers who purchase environmentally-oriented stocks through an SEO and hold them for five years, they earn 22.1% excess returns on average. Similar with the "control" IPOs, underperformance of SEO "control" stocks is observed one year after listing. The 1-year, 3-year and 5-year BHARs for the "control" sample are -3.5% (*t*-statistic -2.91), -11.3% (*t*-statistic-5.55) and -10.5%

(*t*-statistic -3.95), respectively; these results are consistent with earlier studies. The *z*-statistics also suggest that the environmentally-friendly SEO sample is significantly different to the "control" SEO sample in the long run.

In summary, both environmentally-friendly IPOs and SEOs yield positive excess returns in the long run, while the "control" IPOs and SEOs do not. Our results support the Over-performance Hypothesis which implies that investors believe companies with higher environmental standards can create long-term shareholder value; therefore, they perform better than non-environmental companies. We find "green" premiums for both IPOs and SEOs.

4.3. Cross-sectional regressions for IPOs and SEOs

In this section, we investigate whether the "green" premium still exists after controlling for other factors by performing cross-sectional regressions with equity returns for the environmentally-friendly IPO and SEO samples as the dependent variable. In Table 4, we include dummy control variables[7], and test several IPO and

[7] The control dummy variables are $Bubble_i$, $Tech_i$, EPS_i, $NYSE_i$, and ADR_i. The predicted signs for the coefficients of variables $Bubble_i$ and $Tech_i$ are positive, since it is hard to evaluate the intrinsic values of the IPO firms listed during the IT bubble period and technology firms normally have more intangible assets and more risk. Profitable IPO/SEO firms and firms listed on the NYSE should have less

SEO hypotheses which have been shown by previous literature to explain IPO and SEO underpricing (in Panel A of Table 4) and the long-term IPO and SEO underperformance (in Panels B and C of Table 4), respectively. We run a multivariate regression with all possible explanatory variables to investigate whether environmentally-friendly firms are dominant in explaining IPO and SEO effects.

In Panel A of Table 4, the dependent variable is $Underpricing_i$ / $SEO\ Discount_i$, which is measured from the offer price to the first-day closing price and the variable of interest is the dummy variable $Green_i$, which is equal to one if the listing firm or additional issuing firm is classified as an environmentally-friendly IPO/ SEO. The variable $ln(amt)_i$ captures the size effect. To attract investors to subscribe for a large amount of stock sold in the offering, higher discounts might be offered to subscribers. Therefore, a negative coefficient is expected for the variable $ln(amt)_i$. Loughran and Ritter (2004) argue that underwriter rank should be positively related to underpricing because issuers want to attract the best underwriters who will underprice and allocate the IPO shares to current or potential future investment banking clients. Subscribers show their intention to subscribe for IPO/ SEO shares during the book-building

---

underpricing, therefore, the predicted sign for both coefficients of variables EPS_i, and $NYSE_i$ should be negative. No prediction for the coefficient of variable ADR_i, as the potential SRI impact on the non-U.S. domiciled firms is not known.

process (see for example, Benveniste and Spindt (1989)). If the offer price is near the top of the initial filing price range, this implies that subscribers are willing to acquire the IPO/ SEO shares at a relatively high offering price. If the demand for the IPO/ SEO shares is high, the proportion of shares allocated to subscribers will be small. Subscribers might, in such circumstances, purchase "hot" IPOs/SEOs in the aftermarket and boost the share price. Therefore, the predicted sign for the coefficient of variable $Revision_i$ should be positive for IPOs/ SEOs with higher price revisions during the book-building process. Finally, many authors have suggested that the frequency of IPOs and the overall stock-market returns before the IPO listings are positively related to underpricing (see, for example, Hanley (1993) and Loughran and Ritter (2004)). In order to test the market timing hypothesis suggested by Jain and Kini (1994), the independent variables NUM_i and RET_i reflect whether the issue was made during a bull market.

<< Please insert Table 4>>

In Panel A of Table 4, the coefficients for the dummy variable $Green_i$ are not statistically significant. Therefore, there is no evidence of statistically different underpricing for our environmentally-friendly IPO and SEO samples. In the IPO test, consistent with the partial adjustment phenomenon indicated by the previous

literature, the coefficient of variable $Revision_i$ has the predicted sign and is statistically significant at 1% level[8]. For the dummy variables, the coefficients for the variable $Bubble_i$ and EPS_i are positive and statistically significant at a 1% level. Therefore, we observe some evidence of higher underpricing for technology firms and lower underpricing for firms listed on the NYSE in our regressions. In the SEO test, we also find that there is no positive relationship between underpricing and the frequency of SEOs[9]. Inconsistent with the previous literature, the coefficient of the variable $Rank_i$ is negative and statistically significant at 5% level and partial adjustment phenomenon cannot be explained for the short-term underpricing.

.

Panel B presents the cross-sectional regression results for the long-term performance of IPOs. Similar to Panel A, we adopt the same explanatory variables in these regressions. Furthermore, we include the variable $Underpricing_i$ as an independent variable in order to explore the relationship between short-term underpricing and

[8] To examine the relationship between underpricing and price revision, we include the interaction terms in the multivariate regression (not shown in Table 4), except for the term (*GREEN*Revision*) which is negative and statistically significant at 1% level, all other interaction terms with the green dummy are not statistically significant, which implies that the effects of higher price revision and more underpricing will be diminished in the presence of a "green" IPO.

[9] The coefficient of the interaction term (Green*RET) is negative and statistically significant at 5% level, which implies that the effects of market timing hypothesis will be reduced in the presence of a "green" SEO.

long-term stock return performance. Our results in Panel B suggest that the "green" IPO premium exists and is persistent over time. Starting from 6-month event window of interest, the coefficients for $Green_i$ are positive and statistically significant, which reflects that the "green" factor is an important determinant of future stock price performance. There is an evidence of a negative relationship between long-term stock return performance and amount of issuance, while there is a positive association between underwriters' ranking and long-term BHARs. Our results also support the marking timing hypothesis, as expressed by the variable NUM_i. Furthermore, NYSE listed IPOs perform better than non-NYSE listed IPOs, while the IPOs which are listed during the internet bubble period are performed better in the long run. The coefficient for the variable EPS_i is only positive and statistically significant at 5% level for the 1-month and 60-month event window of interest, while for the other investigating periods, a green premium exists even in the absence of positive earnings[10].

[10] Previous research has argued about directional causation between environmental performance and firm profitability (i.e., some scholars suggest that firms adopting higher environmental standards can avoid potential costs of environmental disasters, therefore, they generate higher profits; while others argue that only high profit generating firms can implement stringent environmental standards, as additional costs are incurred by adopting environmental policies). However, we cannot draw a final

In Panel C of Table 4, we present cross-sectional regression results for the long-term performance of SEOs. The main variable of interest is again $Green_i$. We find that the coefficients for $Green_i$ are positive and statistically significant. For example, while holding other factors constant, the environmentally-friendly SEOs earn 12.8% and 16.8% more than the "control" sample in the 2-year and 3-year investigating periods, respectively. However, with the exception of 3-month period, the coefficients for the variable EPS_i are positive but not statistically significant for both the short-term and long-term horizons; which imply that a "green" premium can exist in the absence of positive earnings. The variables $Underpricing_i$ are positive and statistically significant in all investigation periods, while the variable NUM_i is negative and statistically significant, which supports the market timing hypothesis. Moreover, in the short-term horizon, there is evidence that the rank of the SEO lead underwriter and upward adjustment of the filing SEO offer prices can explain the stock return performance. In conclusion, our results in Table 4 reveal that an investor can earn 12% excess return if he/she can clearly distinguish "green" and "non-green" stocks and

---

conclusion on the causal relationship between environmental performance and firm profitability based on our regression results.

hold the environmentally-friendly IPOs (SEOs) one year after listing (additional issuing).

5. Conclusion

A social responsibility index typically has three components: environment, social and corporate governance. There is an abundant literature investigating the relationship between corporate governance and firm performance (see for example, Bebchuk et al. (2013)), while some authors have compared the returns of conventional funds with socially responsible mutual funds (see for example, Hamilton et al. (1993), Cohen et al. (1997), Bauer et al. (2005), Geczy et al. (2005), and Renneboog et al. (2008)) or the returns in broad indexes (see for example, Sauer (1997) and Statman (2000)). This paper extends the literature on environmental-oriented companies into the corporate finance topics of IPOs and SEOs.

The prior literature proposed two hypotheses in explaining stock return performance of environmentally-friendly companies. The underperformance hypothesis suggests that environmentally-friendly companies will underperform in the short-run because their investment opportunity set is restricted by non-financial criteria. In order to fulfill higher environmental standards, extra costs are incurred in designing clean

technology systems and manufacturing environmentally-friendly products. However, in the long-run, companies with higher environmental standards can avoid the potential costs of corporate social crises and environmental disasters. This is valuable not only to shareholders, but also benefits other stakeholders, namely employees, customers, local communities and the environment. Thus, environmentally-friendly companies will over-perform in the long-run (i.e., the over-performance hypothesis).

Based on publicly available information, we identify 748 environmentally-friendly companies being constituents of environmental indices listed on the NYSE, AMEX, and NASDAQ during the period 1990-2012. Consistent with the results in Derwall et al. (2004), our Carhart (1997) four-factor model shows that environmentally-friendly companies earn seven percent excess returns per year. The previous literature has documented long-term underperformance of IPOs and SEOs. Astonishingly, we observe positive and statistically significant BHARs for our environmentally-friendly IPOs and SEOs in both short-term and long-term horizon tests. For instance, we find that the one-year BHARs for environmentally-friendly and "control" IPOs are 12.4% and -7.1%, respectively, while the one-year BHARs for environmentally-friendly and "control" SEOs are 2.5% and -3.5% after controlling for size, book-to-market, and momentum factors. From our cross-sectional regressions, the underpricing of

environmentally-friendly IPOs and SEOs does not differ significantly from “control” firms. The long-term performance tests show that the “green” dummy variable is always positive and statistically significant; thus a “green” factor is important in explaining long-term stock return performance flowing SEOs. Our results support the over-performance hypothesis that proposes companies with higher environmental standards create shareholders’ wealth in the long run. Hence, a “green” premium exists and persists over time.

References

Barber, B.M., Lyon, J.D., Tsai, C.L., 1999. Improved methods for tests of long-run abnormal stock returns. Journal of Finance 54, 1, 165-201.

Barber, B.M., Lyon, J.D., 1997. Detecting long-run abnormal stock returns: The empirical power and specification of test statistics. Journal of Financial Economics 43, 341-372.

Bauer, R., Koedijk, K., Otten, R., 2005. International evidence on ethical mutual fund performance and investment style. Journal of Banking & Finance 29, 1751-1767.

Bebchuk, L., Cohen, A., Wang, C.Y., 2013. Learning and the disappearing association between governance and returns. Journal of Financial Economics 108, 323-348.

Bell, R.G., Filatotchev, I., Rasheed, A.A., 2012. The liability of foreignness in capital markets: Sources and remedies. Journal of International Business Studies 43, 107-122.

Benveniste, L.M., Spindt, P.A., 1989. How investment bankers determine the offer price and allocation of new issues? Journal of Financial Economics 24, 343-361.

Borgers, A., Derwall, J., Koedijk, K., Horst, J. T., 2013. Stakeholder relations and stock returns: On errors in investors' expectations and learning. Journal of Empirical Finance 22, 159-175.

Carhart, M.M., 1997. On persistence in mutual fund performance. Journal of Finance

52, 57-82.

Cliff, M.T., Denis, D.J., 2004. Do initial public offering firms purchase analyst coverage with underwriting. Journal of Finance 59, 6, 2871-2901.

Cohen, M.A., Fenn, S.A., Konar, S., 1997. Environmental and financial performance: Are they related?. Vanderbilt University Working Paper.

Cook, D.O., Kieschnick, R., Van Ness, R.A., 2006. On the marketing of IPOs. Journal of Financial Economics 82, 35-61.

Daniel, K., Grinblatt, M., Titman, S., Wermers, R., 1997. Measuring mutual fund performance with characteristics-based benchmarks. Journal of Finance 43, 3-27.

Derwall, J., Guenster, N., Bauer, R. and Koedijk, K., 2004. The eco-efficiency premium puzzle. Financial Analysts Journal 61, 2, 51-63.

Fama, E.F., French, K.R., 1992. The cross-section of expected stock returns. Journal of Finance 47, 427-465.

Geczy, C.C., Stambaugh, R.F., Levin, D., 2005. Investing in socially responsible mutual funds. The Wharton School of the University Pennsylvania Working Paper.

Hamilton, S., Hoje, J., Statman, M., 1993. Doing well while doing good? The investment performance of socially responsible mutual funds. Financial Analysts Journal. 6, 62-66.

Hanley, K., 1993. The underpricing of initial public offerings and the partial

adjustment phenomenon. Journal of Financial Economics 34, 231-250.

Jain, B.A., Kini, O., 1994. The post-issue operating performance of IPO firms, Journal of Finance 49, 5, 1699-1726.

Klassen, R.D., McLaughlin, C.P., 1996. The impact of environmental management on firm performance. Management Science 42, 8, 1199-1214.

Loughran, T., Ritter, J.R., 2004. Why has IPO underpricing changed over time?. Financial Management 33, 5-37.

Petersen, M.A., 2009. Estimating standard errors in finance panel data sets: Comparing approaches. The Review of Financial Studies 22, 1, 435-480.

Renneboog, L., Horst, J.T., Zhang, C., 2011. Is ethical money financially smart? Nonfinancial attributes and money flows of socially responsible investment funds. Journal of Financial Intermediation 20, 562-588.

Renneboog, L., Horst, J.T., Zhang, C., 2008. The price of ethics and stakeholder governance: The performance of socially responsible mutual funds. Journal of Corporate Finance 14, 302-322.

Ritter, J.R., Welch, I., 2002. A review of IPO activity, pricing, and allocation. Journal of Finance 57, 1795-1828.

Sauer, D.A., 1997. The impact of social-responsibility screens on investment performance: Evidence from the Domini 400 social index and Domini equity mutual

fund. Review of Financial Economics 6, 2, 137-149.

Statman, M., 2000. Socially responsible mutual funds. Financial Analysts Journal 56, 3, 30-39.

Yamashita, M., Sen, S., Roberts, M. C., 1999. The rewards for environmental conscientiousness in the U.S. capital market. Journal of Financial and Strategic Decision 12, 1, 73-82.

Table 1 –Return analysis of the "green" sample

In Panel A, we calculate BHARs based on the size, book-to-market, and momentum adjusted portfolios for the "green" sample with prices available in the Center for Research in Security Prices (CRSP) historical daily stock price data and COMPUSTAT historical annually industrial and accounting data. The "green" companies are constituents from one of the environmentally-friendly exchange-traded funds defined in the Appendix. In Panel B, we estimate four-factor regressions of equal-weighted monthly returns for portfolios of "green" companies. The explanatory variables are *RMRF*, *SMB*, *HML*, and *Mom*. These variables are the returns to zero-investment portfolios designed to capture market, size, book-to-market, and momentum effects, respectively. The sample period is from January 1990 through December 2012.

Panel A: The BHARs based on size, book-to-market, and momentum on a yearly basis

Year	Obs.	Median	Mean	S.D.	t-statistic
1990	363	0.018	0.066	0.391	3.22 ***
1991	380	0.039	0.145	0.487	5.81 ***
1992	414	0.058	0.127	0.441	5.84 ***
1993	442	0.044	0.119	0.400	6.24 ***
1994	467	0.013	0.049	0.413	2.55 **
1995	488	-0.038	0.029	0.641	0.99
1996	512	-0.009	0.028	0.393	1.59
1997	542	0.001	0.056	0.523	2.45*
1998	566	-0.156	-0.049	0.671	-1.72
1999	586	-0.198	0.057	1.251	1.10
2000	606	0.249	0.357	0.772	11.37***
2001	627	0.139	0.244	0.628	9.72 ***
2002	633	0.130	0.129	0.472	6.85 ***
2003	641	0.023	0.182	0.575	8.03 ***
2004	664	0.056	0.099	0.322	7.93 ***
2005	683	0.011	0.091	0.535	4.46 ***
2006	709	0.015	0.046	0.287	4.24 ***
2007	743	-0.006	0.097	0.534	4.96 ***
2008	748	0.019	0.026	0.438	1.64 *
2009	738	0.021	0.218	0.892	6.63 ***
2010	741	0.024	0.075	0.354	5.78 ***
2011	738	-0.025	-0.051	0.306	-4.54 ***
2012	736	-0.011	0.005	0.353	0.37

t-statistic that the BHAR equals zero.***, **and * significant at α = 0.01, 0.05 and 0.10, respectively (two-tail test).

Panel B: Cahart four-factor regressions for the "green" portfolios

R(Green)-RF(t)	α	RMRF(t)	SMB(t)	HML(t)	Mom(t)	Adj-R^2
All Sample	0.62 ***	1.02***	0.37***	0.30***	-0.12***	94.0%
(1990-2012)	(0.08)	(0.02)	(0.02)	(0.03)	(0.02)	
1995-2012	0.57 ***	1.02 ***	0.38 ***	0.34 ***	-0.13 ***	94.0%
	(0.09)	(0.02)	(0.03)	(0.03)	(0.02)	
2000-2012	0.67 ***	1.03 ***	0.34 ***	0.36 ***	-0.11 ***	93.7%
	(0.12)	(0.03)	(0.04)	(0.04)	(0.02)	
2005-2012	0.39 ***	1.13 ***	0.53 ***	-0.04	-0.12 ***	96.8%
	(0.11)	(0.03)	(0.06)	(0.05)	(0.02)	

Standard errors are reported in parentheses and significance at $\alpha = 0.10$, 0.05 and 0.01 levels is indicated by *, **, and *** respectively.

Table 2 –Descriptive statistics for "green" and "control" samples

This table presents descriptive statistics for "green" and "control" samples of IPOs and SEOs, respectively. Underpricing (SEO discount) is measured from the offer price to the first-day closing price. Amount (millions of dollars) is the dollar value of the amount of stock sold in the offering. Money left on the table (millions of dollars) is calculated as the number of shares issued times the change from the offer price to the first-day closing price. Revision is the difference between the offer price and mid-point of the initial filing price relative to the mid-point of the initial filing range. Underwriter Rank is the rank of the lead underwriter using Ritter's updated Carter-Manaster ranking, where nine is the highest rank and one is the lowest rank. Dilution is the reduction in the ownership percentage of current investors, founders, and employees caused by the issuance of new shares. Gross spread is defined as total expenses (underwriting fees, management fees, re-allowances and selling concessions) as a percentage of total proceeds. EPS (cents) is the earnings per share for the fiscal year prior to the offer date. PE ratio is the price divided by EPS for the fiscal year prior to the offer date. IPONUM (SEONUM) is the number of firms going public (issuing equity) during the previous 30 days; RET is the BHAR based on the value-weighted market portfolios benchmarks three months prior to the offer date for an IPO or SEO.

Panel A: Descriptive statistics for "green" and "control" samples of IPOs

	Green Sample				**Control Sample**			
	Median	**Mean**	**S.D.**		**Median**	**Mean**	**S.D.**	**z-test**
Offer price (dollars)	15.00	15.83	5.28		15.00	15.22	4.84	3.00***
Underpricing (%)	9.81	15.57	21.98		8.61	16.10	29.02	-0.11
Amount (millions)	97.75	183.91	241.05		84.60	135.11	135.85	39.28***
Money left on the table (millions)	7.88	26.14	51.04		2.97	7.22	46.16	29.88***
Revision (%)	0.00	-0.33	9.44		0.00	0.54	9.03	-0.31
Underwriter rank	9.00	8.42	1.02		9.00	8.22	1.28	1.99**
Dilution (%)	21.59	22.98	14.45		27.29	32.75	21.30	-22.84***
Gross spread (%)	7.00	6.42	0.95		7.00	6.55	0.87	-1.45
EPS (dollars)	0.49	0.31	0.97		0.34	0.14	1.52	1.60
PE ratio	23.98	36.37	40.16		23.16	33.71	32.11	3.68***
IPONUM	36.00	39.88	22.92		34.50	39.57	23.04	0.71
RET (%)	2.96	2.96	4.52		2.79	2.80	4.57	0.08
Panel B: Descriptive statistics for the "green" and "control" samples of SEOs								
	Green Sample				**Control Sample**			
	Median	**Mean**	**S.D.**		**Median**	**Mean**	**S.D.**	**z-test**
Offer price (dollars)	28.00	31.12	19.13		24.75	26.91	16.53	23.61***
SEO discount(%)	1.13	2.37	4.36		0.63	1.93	4.27	0.46
Amount (millions)	148.40	250.10	276.62		129.55	203.65	208.70	70.81***
Money left on the table (millions)	0.75	-2.93	38.47		0.00	-37.89	115.24	92.69***
Revision (%)	-2.41	-3.04	9.33		-3.10	-3.69	9.33	0.51
Underwriter rank	9.00	8.52	0.82		9.00	8.32	0.96	4.76
Dilution (%)	6.42	8.14	6.31		10.14	12.62	9.17	-32.91***
Gross spread (%)	4.00	3.94	1.37		4.50	4.28	1.30	-6.39***
EPS (dollars)	1.04	1.03	1.39		0.88	0.78	1.55	4.52***
PE ratio	21.49	26.85	17.33		20.54	26.40	21.46	1.84*
SEONUM	52.00	53.75	22.40		53.00	54.02	22.99	-1.32
RET (%)	3.73	3.42	6.46		3.66	3.45	6.21	-0.03

Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1% respectively.

Table 3 –BHARs for the sample of IPOs and SEOs

Post-announcement BHARs based on size, book-to-market, and momentum portfolios with prices available in the Center for Research in Security Prices (CRSP) historical daily stock price data are presented. The "green" IPO and SEO companies are constituents of one of the environmental services indices defined in the Appendix. The "control" IPO and SEO companies are constructed by matching on the market capitalization at the time of issuance. For each event window of interest, a conventional *t*-statistic based on the cross-sectional standard deviation of rated firms' abnormal returns is calculated. The level of significance on the abnormal returns calculated by BHARs based on the size, book-to-market, and momentum portfolio returns is tested. The *z*-statistic based on the differences in mean returns is also presented. The numbers of "green" IPOs and SEOs are 241 and 1124, respectively.

Panel A: The "green" and "control" samples of IPOs								
(i) The "green" sample of IPOs								
Periods	**1-month**	**3-month**	**6-month**	**12-month**	**24-month**	**36-month**	**48-month**	**60-month**
Median	0.013	0.033	0.078	0.081	0.057	0.099	0.068	0.091
Mean	0.038	0.083	0.125	0.124	0.278	0.386	0.482	0.497
S.D.	0.146	0.284	0.385	0.506	0.917	1.145	1.400	1.400
t-statistic	4.02***	4.54***	5.03***	3.75***	4.55***	4.94***	4.98***	5.08***
(ii) The "control" sample of IPOs								
Median	0.004	-0.022	-0.023	-0.094	-0.293	-0.307	-0.315	-0.306
Mean	0.004	-0.005	-0.031	-0.071	-0.188	-0.156	-0.114	-0.078
S.D.	0.123	0.230	0.316	0.418	0.519	0.575	0.678	0.765
t-statistic	0.50	-0.30	-1.49	-2.53**	-5.08***	-3.52***	-2.04**	-1.15
Difference	0.034	0.088	0.130	0.195	0.466	0.541	0.597	0.575
z-statistic	1.00	1.88*	3.06***	3.07***	5.69***	5.79***	5.61***	5.07**
Panel B: The "green" and "control" sample of SEOs								
(i) The "green" sample of SEOs								
Periods	**1-month**	**3-month**	**6-month**	**12-month**	**24-month**	**36-month**	**48-month**	**60-month**
Median	-0.004	0.008	0.015	0.000	-0.007	0.011	0.036	0.047
Mean	0.002	0.018	0.022	0.025	0.052	0.098	0.159	0.221
S.D.	0.104	0.171	0.256	0.354	0.511	0.591	0.687	0.791
t-statistic	0.57	3.46***	2.81***	2.34**	3.23***	5.07***	6.60***	7.79***
(ii) The "control" sample of SEO								
Median	-0.009	-0.013	-0.017	-0.044	-0.146	-0.165	-0.191	-0.180
Mean	0.002	-0.007	-0.016	-0.035	-0.114	-0.113	-0.132	-0.105
S.D.	0.121	0.178	0.265	0.365	0.455	0.538	0.548	0.590
t-statistic	0.60	-1.19	-1.86*	-2.91***	-7.08***	-5.55***	-5.63***	-3.95***
Difference	-0.001	0.025	0.038	0.061	0.166	0.212	0.290	0.326
z-statistic	-0.04	1.34	1.67*	2.24**	5.06***	5.64***	6.77***	6.93***

t-statistic (*z*-statistic) that the BHAR equals zero (i.e., that the (green-control) BHAR is different from zero).***, **and * Significant at $\alpha = 0.01, 0.05$ and 0.10, respectively (two-tail test).

Table 4 –Short-term and long-term performance of IPOs/SEOs: Cross-sectional regression on equity returns

This Table presents regression results from estimating the following equations:

$$Underpricing_t \ /SEO\ Discount_t = \alpha_1 + \beta_2 \ln(amt) + \beta_3 Rank + \beta_4 Revision + \beta_5 NUM + \beta_6 RET + \beta_7 Bubble + \beta_8 Tech + \beta_9 EPS + \beta_{10} NYSE + \beta_{11} ADR + \beta_{12} Green + \varepsilon$$

$$BHAR_t = \alpha_1 + \beta_2 \ln(amt) + \beta_3 (Underpricing/SEO\ Discount) + \beta_4 Rank + \beta_5 Revision + \beta_6 NUM + \beta_7 RET + \beta_8 Bubble + \beta_9 Tech + \beta_{10} EPS + \beta_{11} NYSE + \beta_{12} ADR + \beta_{13} Green + \varepsilon ;$$

where $Underpricing_t$ /*SEO Discount*$_t$ is measured from the offer price to the first-day closing price; $BHAR_t$ is the buy-and-hold abnormal return based on size, book-to-market and momentum portfolios benchmarks; *Amt* (millions of dollars) is the dollar value of the amount of stock sold in the offering; *Revision* is the difference between the offer price and midpoint of the initial filing price relative to the mid-point of the initial filing range; *Rank* is the rank of the lead underwriter using Ritter's updated Carter-Manaster ranking; *Bubble* is equal to one if the offer date occurs during 1999 and 2000, and zero otherwise; *Tech* is equal to one if the firm is in a high technology industry as identified by Loughran and Ritter (2004); *EPS* is equal to one if the earning per share is greater than zero, and zero otherwise; *NYSE* is equal to one if the IPO/SEO firm is listed on the New York Stock Exchange; *NUM* is the number of firms going public or undergoing seasoned equity offerings during the previous 30 days; *RET* is the BHARs based on the value-weighted market portfolios benchmarks three months prior to the offer date for an IPO/SEO; *ADR* is equal to one if the observation is the American Depository Receipt (ADR), and zero otherwise; *Green* is equal to one if the IPO/SEO firm is defined as a green IPO/SEO, zero otherwise. Standard errors based on Petersen (2009) and modified by clustering by industry and year are reported in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1% respectively. Panel A show the short-term performance of the IPOs and SEOs, while The BHARs based on different time windows of interest for the IPO and SEO samples are presented in Panel B and Panel C, respectively.

Panel A: Short-term performance of IPOs/SEOs: Cross-sectional regression on equity returns

	Intercept	Ln(amt)	Rank	Revision	Num	RET	Bubble	Tech	EPS	NYSE	ADR	Green	Adj R^2
IPO Underpricing	**0.174**** **(0.08)**	-0.001 (0.01)	-0.005 (0.01)	**0.553***** **(0.13)**	-0.000 (0.00)	0.176 (0.19)	**0.171***** **(0.03)**	**0.155**** **(0.07)**	**0.080***** **(0.02)**	**-0.044*** **(0.03)**	-0.015 (0.05)	-0.028 (0.03)	14.95%
SEO Discount	**0.045***** **(0.01)**	0.001 (0.00)	**-0.003**** **(0.00)**	-0.004 (0.01)	0.000 (0.00)	0.026 (0.02)	**0.005*** **(0.03)**	0.006 (0.01)	**-0.005*** **(0.00)**	**-0.010***** **(0.00)**	**-0.010**** **(0.01)**	0.003 (0.00)	4.34%

Panel B: long-term performance of IPOs: Cross-sectional regression on equity returns														
	Intercept	**Ln(amt)**	**Underpricing**	**Rank**	**Revision**	**Num**	**RET**	**Bubble**	**Tech**	**EPS**	**NYSE**	**ADR**	**Green**	**Adj R^2**
1-month BHAR	0.063 (0.06)	**-0.021** (0.01)**	-0.023 (0.03)	0.002 (0.01)	**-0.091** (0.04)**	-0.000 (0.00)	0.084 (0.12)	**0.032*** (0.01)**	0.017 (0.04)	**0.030** (0.01)**	0.018 (0.01)	0.023 (0.03)	0.024 (0.02)	4.47%
3-month BHAR	-0.050 (0.08)	-0.021 (0.02)	-0.039 (0.04)	0.018 (0.02)	**-0.201* (0.11)**	-0.000 (0.00)	0.202 (0.22)	0.021 (0.02)	0.011 (0.07)	0.031 (0.02)	0.012 (0.02)	0.055 (0.07)	0.048 (0.03)	3.19%
6-month BHAR	-0.075 (0.10)	-0.024 (0.02)	**-0.169** (0.07)**	0.019 (0.02)	-0.060 (0.11)	0.000 (0.00)	-0.227 (0.32)	**0.085** (0.04)**	0.039 (0.10)	0.026 (0.03)	**0.076* (0.04)**	0.024 (0.09)	**0.123** (0.05)**	5.95%
12-month BHAR	-0.056 (0.26)	-0.037 (0.04)	-0.114 (0.10)	0.019 (0.03)	0.122 (0.19)	-0.001 (0.00)	-0.073 (0.45)	**-0.167** (0.07)**	0.333 (0.21)	0.110 (0.07)	**0.166*** (0.05)**	-0.014 (0.08)	**0.121** (0.06)**	7.86%
24-month BHAR	**-0.518 (0.23)****	-0.043 (0.05)	-0.149 (0.19)	**0.074** (0.03)**	0.044 (0.35)	-0.002 (0.00)	-0.501 (0.81)	0.056 (0.19)	0.524 (0.45)	0.087 (0.11)	0.117 (0.10)	-0.168 (0.12)	**0.342*** (0.08)**	7.95%
36-month BHAR	-0.077 (0.33)	-0.062 (0.06)	-0.116 (0.18)	0.049 (0.03)	-0.275 (0.38)	**-0.006*** (0.00)**	0.390 (0.99)	0.147 (0.13)	-0.073 (0.29)	0.020 (0.14)	0.202 (0.19)	0.021 (0.22)	**0.551*** (0.11)**	9.19%
48-month BHAR	-0.641 (0.52)	**-0.138* (0.08)**	-0.191 (0.37)	**0.144** (0.06)**	-0.421 (0.81)	-0.004 (0.00)	0.718 (1.50)	0.308 (0.22)	1.075 (0.76)	0.180 (0.19)	0.298 (0.21)	-0.103 (0.32)	**0.489*** (0.12)**	8.16%
60-month BHAR	**-0.740** (0.37)**	**-0.173** (0.07)**	-0.148 (0.40)	**0.186*** (0.05)**	-1.221 (0.96)	**-0.007* (0.00)**	0.367 (1.62)	**0.521** (0.26)**	**0.485* (0.28)**	**0.413** (0.21)**	**0.403* (0.24)**	-0.424 (0.38)	**0.384*** (0.10)**	10.18%
Panel C: long-term performance of SEOs: Cross-sectional regression on equity returns														
	Intercept	**Ln(amt)**	**SEO Discount**	**Rank**	**Revision**	**Num**	**RET**	**Bubble**	**Tech**	**EPS**	**NYSE**	**ADR**	**Green**	**Adj R^2**
1-month BHAR	**-0.102*** (0.02)**	**0.013*** (0.00)**	**0.898*** (0.11)**	**0.007** (0.00)**	**0.292*** (0.03)**	**-0.000* (0.00)**	-0.022 (0.04)	**-0.027** (0.01)**	-0.004 (0.03)	0.009 (0.01)	**-0.013* (0.01)**	-0.007 (0.03)	-0.007 (0.01)	22.67%
3-month BHAR	**-0.234*** (0.04)**	**0.015** (0.01)**	**1.046*** (0.15)**	**0.015*** (0.00)**	**0.241*** (0.05)**	-0.000 (0.00)	0.026 (0.08)	0.008 (0.01)	-0.035 (0.05)	**0.058*** (0.02)**	-0.009 (0.01)	-0.020 (0.04)	0.004 (0.01)	12.45%
6-month BHAR	**-0.209*** (0.04)**	0.003 (0.01)	**1.163*** (0.18)**	**0.019*** (0.01)**	**0.267*** (0.07)**	**-0.001** (0.00)**	0.120 (0.12)	0.004 (0.02)	-0.079 (0.07)	0.040 (0.03)	0.019 (0.02)	0.027 (0.05)	0.020 (0.02)	6.92%
12-month BHAR	**-0.341*** (0.06)**	0.001 (0.02)	**0.943*** (0.29)**	**0.034*** (0.01)**	**0.209** (0.08)**	**-0.001* (0.00)**	0.047 (0.18)	-0.026 (0.02)	**-0.149* (0.09)**	0.041 (0.04)	0.060 (0.04)	-0.057 (0.07)	**0.047* (0.03)**	5.38%
24-month BHAR	**-0.288** (0.11)**	-0.017 (0.02)	**0.543* (0.29)**	**0.028** (0.01)**	0.103 (0.10)	**-0.002** (0.00)**	-0.016 (0.28)	0.040 (0.11)	-0.089 (0.09)	0.082 (0.06)	**0.131*** (0.04)**	-0.108 (0.11)	**0.128*** (0.04)**	6.26%
36-month BHAR	-0.144 (0.16)	-0.033 (0.03)	**0.808** (0.32)**	0.017 (0.01)	0.108 (0.15)	-0.001 (0.00)	-0.331 (0.35)	-0.111 (0.11)	-0.015 (0.13)	0.061 (0.08)	**0.198*** (0.04)**	0.008 (0.19)	**0.168*** (0.04)**	6.18%
48-month	-0.042	-0.054	**0.995****	0.018	0.257	-0.002	-0.417	-0.058	0.003	0.081	**0.148****	**0.230***	**0.231***	5.05%

BHAR	(0.20)	(0.03)	**(0.37)**	(0.02)	(0.19)	(0.00)	(0.38)	(0.11)	(0.12)	(0.09)	**(0.06)**	**(0.13)**	**(0.05)**	
60-month	-0.096	**-0.053***	**1.643*****	0.012	0.286	0.000	-0.033	-0.015	0.083	0.109	**0.180****	0.102	**0.253*****	4.68%
BHAR	(0.23)	**(0.03)**	**(0.51)**	(0.03)	(0.22)	(0.00)	(0.48)	(0.11)	(0.14)	(0.10)	**(0.08)**	(0.21)	**(0.06)**	
Standard errors are reported in parentheses. Levels of significance are indicated by *, **, and *** for 10%, 5%, and 1% respectively.														

Appendix – The major environmentally-friendly exchange-traded (ETF) funds listed on the NYSE, AMEX and NASDAQ

This Appendix presents descriptions of each environmentally-friendly exchange-traded funds that are traded on the NYSE, AMEX, and NASDAQ.

Exchange-traded Funds	**Ticker**	**Nos. of Stocks**	**Indices (Listing Date)**	**Descriptions**
AdvisorShares Global Echo ETF (IPO -24 May 2012)	GIVE	74		GIVE is a multi-manager, multi-strategy, broadly diversified, and actively managed ETF with a focus on Sustainable Investing. The fund invests primarily in U.S. and foreign equity securities. The Fund may take both long and short positions.
Claymore- LGA Green ETF	GRN	179	Eco*Index^{TM} Index (10 Oct 2006)	GRN designs to capture the performance of U.S. listed large-cap companies for their having better than average environmental performance relative to their industry peers. The initial benchmark value is 1000.00 at close of trading October 10, 2006.
First Trust Global Wind Energy ETF	FAN	51	ISE Global Wind Energy Index (06 Jun 2008)	FAN will invest at least 90% of its net assets (plus the amount of any borrowings for investment purposes) in common stocks that comprise the index or in depositary receipts representing securities in the index. FAN invests in sectors, which include Consumer Discretionary, Energy, Industrials, materials and Utilities.
First Trust ISE Water Index Fund	FIW	36	ISE Water Index (20 Nov 2006)	FIW consists of 36 stocks that derive a substantial portion of their revenues from the potable and wastewater industries. FIW invests at least 90% of its assets in common stocks that comprise the index.
First Trust NASDAQ Clean Edge Green Energy Index Fund	QCLN	43	Clean Edge U.S. Liquid Series Index (17 Nov 2006)	QCLN invests on the companies that are primarily manufacturers, developers, distributors and/or installers of clean energy technologies, as defined by Clean Edge.
First Trust NASDAQ Clean Edge Smart Grid Infrastructure Index Fund	GRID	31	NASDAQ OMX Clean Edge Smart Grid Infrastructure Index (22 Sep 2009)	GRID is designed to track the performance of common stocks in the grid and electric energy infrastructure sector. The fund includes companies that are primarily engaged and involved in electric grid, electric meters and devices, networks, energy storage and management, and enabling software used by the smart grid infrastructure sector.
Guggenheim S&P Global Water Index ETF - formerly Claymore S&P Global Water Index ETF	CGW	51	S&P Global Water NR Index (22 Feb 2007)	CGW consists of approximately 50 equity securities selected based on investment and other criteria, from a universe of companies listed on global developed market exchanges. The Fund is designed to have a balanced representation from different segments of the water industry consisting of two clusters: 25 water utilities and infrastructure companies and 25 water equipment and materials companies based upon Standard & Poor's Capital IQ industry classification. The fund will invest at least 90% of its total assets in common stock and American Depositary receipts that comprise the index depositary receipts representing common stocks included in the Index.
Guggenheim Solar ETF - formerly Claymore/MAC	TAN	28	MAC Global Solar Energy Index	TAN consists of approximately 25 stocks selected based on the relative importance of solar power within the Company's business model, as determined by MAC Indexing LLC. The Fund is designed to track companies within the business segments of the solar

Global Solar Energy Index ETF			(15 Apr 2008)	energy industry, which include companies that produce solar power equipment and products for end users, companies that produce fabrication products (such as the equipment used by solar cell and module producers to manufacture solar power equipment) or services (such as companies specializing in the solar cell manufacturing or the provision of consulting services to solar cell and module producers) for solar power equipment producers.
Huntington Ecological Strategy ETF (IPO - 20 Jun 2012)	HECO	50		HECO is an actively managed exchange-traded fund and, under normal conditions, will invest at least 80% of its net assets in the exchange-listed equity securities of ecologically-focused companies
iShares MSCI KLD 400 Social ETF - formerly iShares FTSE KLD 400 Social Index Fund	DSI	398	MSCI KLD 400 Social Index (02 Jan 2007)	DSI consists of approximately 400 companies identified by MSCI from the universe of companies included in the MSCI USA IMI Index, which consists of NYSE and NASDAQ listed United States equities.

Exchange-traded Funds	**Ticker**	**Nos. of Stocks**	**Indices (Listing Date)**	**Descriptions**
iShares S&P Global Clean Energy Index Fund	ICLN	32	iShares S&P Global Clean Energy Index (24 Jun 2008)	ICLN includes clean energy production companies, clean energy equipment and technology providers. For these purposes, the "clean energy" universe includes biofuel and biomass, ethanol and fuel alcohol, geothermal energy, hydroelectricity, solar and wind energy.
Market Vectors – Solar Energy ETF	KWT	33	Ardour Solar Energy Index (SOLRX) (31 Dec 2004)	KWT invests in a portfolio of securities that generally replicates SOLRX. SOLRX calculated and maintained by Dow Jones Indexes on behalf of Ardour Global Indexes LLC. The fund provides exposure to publicly traded companies from around the world that derive at least 66% of their revenues from solar power and related products and services. On a weighted basis, the companies in the fund derive in excess of 90% of their revenues from the solar industry.
Market Vectors Environmental Services Index Fund	EVX	27	NYSE Arca Environmental Services Index (31 Dec 2003)	EVX consists of publicly traded companies that are involved in the management, removal and storage of consumer waste and industrial by-products and related environmental services. The fund is passively managed and may not hold each index component in the same weighting as the index. The fund may not exactly replicate the performance of the index.
Market Vectors Global Alternative Energy ETF Trust	GEX	30	Ardour Global Index (Extra Liquid) Index (01 Jan 2001)	GEX tracks the overall performance of a global universe of listed companies engaged in the alternative energy industry. The Fund comprises a globally diversified group of companies engaged in the production of alternative fuels and/or related technologies. Companies eligible for inclusion should be engaged in the alternative energy industry with market cap exceeding $100 million and should have three-month average daily trading price greater than $1 per share.
PowerShares Cleantech Portfolio	PZD	60	Cleantech Index (31 Dec 1999)	PZD invests at least 90% of its total assets in securities that comprise the Index and American Depository Receipts (ADR) based on the stocks in the index. The Fund invests in securities, such as consumer discretionary, health care, industrials, materials, utilities and information technology. The initial value was 500 at market close, 31 Dec 1999.
PowerShares Global Clean Energy Portfolio	PBD	97	WilderHill New Energy Global Innovation Index (01 Jan 2006)	PBD invests at least 90% of its total assets in the equity securities that comprise the Index and American Depository receipts (ADR) that are based on the securities in the index. The Index seeks to deliver capital appreciation and is composed of companies that focus on greener and generally renewable sources of energy and technologies facilitating cleaner energy. The Fund will invest in consumer discretionary, consumer staples, energy, industrials, information technology, materials and utilities sectors.

PowerShares Global Water Portfolio	PIO	36	NASDAQ OMX Global Water Index (13 Jun 2007)	PIO invests at least 90% of its total assets in the equity securities that comprise the Index and American Depository receipts (ADR) that are based on the securities in the index.
PowerShares Water Resources Portfolio	PHO	29	NASDAQ OMX US Water Index (06 Dec 2005)	PHO invests at least 90% of its total assets in common stocks that comprise the underlying index. The index seeks to track the performance of the U.S. exchange-listed companies that create products designed to conserve and purify water for homes, business and industries. The fund invests in the sector such as industrials, utilities, healthcare, information technology and materials.
PowerShares WilderHill Progressive Energy Portfolio	PUW	55	WilderHill Progressive Energy Index (13 Oct 2006)	PUW invests at least 90% of its total assets in common stocks that comprise the index. The index is comprised the United States-listed companies that are involved in transitional energy bridge technologies, with an emphasis on improving the use of fossil fuels. The fund invests in the sectors, such as consumer discretionary, industrial, information technology, materials, utilities, energy and consumer staples.
PowerShares WilderHill Clean Energy Portfolio	PBW	51	WilderHill Clean Energy Index (16 Aug 2004)	PBW invests at least 90% of its total assets in common stocks that comprise the index. The index is designed to deliver capital appreciation through the selection of companies that focus on greener and generally renewable sources of energy and technologies that facilitate cleaner energy. The fund invests in the sectors, such as consumer discretionary, industrial, information technology, materials, utilities, energy and consumer staples.